FOCAL

CA1
DTC 800
89
F72

CA1
DTC800-
89
F72

429959

41.D

. CAI
DTC 800
89
F72

TP 10026E

m m.

FURTHER DEVELOPMENT OF SHIPBOARD FIBRE OPTIC STANDARDS

Prepared for

Transportation
Development Centre
Policy and Coordination Group

Transport Canada

By

Focal Technologies Inc.

September 1989

429959

DCN 429957

90-04093/

TP 10026E

FURTHER DEVELOPMENT OF SHIPBOARD FIBRE OPTIC STANDARDS

By

J.S Mayich

Focal Technologies Incorporated

September 1989

DISCLAIMER:

The contents of this report reflect the views of Focal Technologies Incorporated and not necessarily the official view or opinions of the Transportation Development Centre of Transport Canada.

LANGUAGE NOTICE

Un sommaire en français de ce rapport est inclus avant la table des matiéres.

Transport Canada / Transports Canada

PUBLICATION DATA FORM

1. Transport Canada Publication No.	2. Project No.	3. Recipient's Catalogue No.
TP10026E	6932	

4. Title and Subtitle	5. Publication Date
Further Development of Shipboard Fibre Optic Standards	September 1989
	6. Performing Organization Document No. 78718

7. Author(s)	8. Transport Canada File No.
John S. Mayich	D1460-198-3

9. Performing Organization Name and Address	10. DSS File No.
Focal Technologies Incorporated 40 Thornhill Drive, Unit 7 Dartmouth, Nova Scotia B3B 1S1	OSC87-00205(014)
	11. DSS or Transport Canada Contract No. T8200-7-7515/01-OSC

12. Sponsoring Agency Name and Address	13. Type of Publication and Period Covered
Transport Development Centre 200 René Lévesque Blvd. West West Tower, Suite 601 Montréal, Québec H2Z 1X4	Final Sept 87- Sept 89
	14. Project Officer M. Avni

15. Supplementary Notes (Funding programs, titles of related publications, etc.)

16. Abstract

The purpose of this project was to promote, and foster the adoption of, shipboard fibre optic standards developed by Focal Technologies Incorporated in an earlier contract. The primary methodology was through liaison and presentation to the Society of Naval Architects and Marine Engineers (SNAME) and the International Electrotechnical Commission (IEC).

The project was successful in influencing the publications of SNAME. Although submissions have been made to the IEC, that organization is not yet prepared to publish any material specific to the shipboard application of fibre optics.

17. Key Words	18. Distribution Statement
Fibre Optics standards, shipboard	Limited number of copies available from the Transportation Development Centre

19. Security Classification (of this publication)	20. Security Classification (of this page)	21. Declassification (date)	22. No. of Pages	23. Price
Unclassified	Unclassified	-	20	-

TDC/CDT 79-005
Rev 88

Canada

Transports Canada Transport Canada

FORMULE DE DONNÉES POUR PUBLICATION

1. N° de la publication de Transports Canada	2. N° de l'étude	3. N° de catalogue du destinataire
TP10026E	6932	

4. Titre et sous-titre	5. Date de la publication
Further Development of Shipboard Fibre Optic Standards	Septembre 1989
	6. N° du document de l'organisme exécutant: 78718

7. Auteur(s)	8. N° de dossier — Transports Canada
John S. Mayich	D1460-198-3

9. Nom et adresse de l'organisme exécutant	10. N° de dossier — ASC
Focal Technologies Incorporated 40 Thornhill Drive, Unit 7 Darthmouth, Nova Scotia B3B 1S1	OSC87-00205 (014)
	11. N° de contrat — ASC ou Transports Canada: T8200-7-7515/01-OSC

12. Nom et adresse de l'organisme parrain	13. Genre de publication et période visée
Centre de Développement des Transports (CDT) 200 ouest boul. René Lévesque Bureau 601, Tour ouest Montréal, Québec H2Z 1Y4	Final, sept. 87 - sept. 89
	14. Agent de projet: M. Avni

15. Remarques additionnelles (Programmes de financement, titres de publications connexes, etc.)

16. Résumé

Ce projet avait pour objectif de promouvoir l'adoption des spécifications élaborées par la Focal Technologies Incorporated dans le cadre d'une recherche antérieure sur les utilisations marines des câbles à fibres optiques. Cette société a procédé principalement par voie de consultations et présentations auprès de la Society of Naval Architects and Marine Engineers (SNAME) et de la Commission électrotechnique internationale (CEI).

Ces efforts ont été couronnés de succès pour ce qui concerne les publications de la SNAME. Quant à la CEI, malgré les propositions qui lui ont été soumises, elle n'est pas prête à publier un document traitant spécifiquement des applications marines des fibres optiques.

17. Mots clés	18. Diffusion
Fibres optiques, spécifications, utilisations marines.	Le Centre de développement des transports dispose d'un nombre limité d'exemplaires.

19. Classification de sécurité (de cette publication)	20. Classification de sécurité (de cette page)	21. Déclassification (date)	22. Nombre de pages	23. Prix
non classifié	non classifié	-	20	-

CDT/TDC 79-005
Rev 88

Canada

SUMMARY

Draft standards for the use of fibre optic technology on ships were developed on a previous project. The purpose of this project was to promote the adoption of these drafts through collaboration with the various international bodies having an interest in such standards.

The development of standards for the shipboard use of fibre optics is progressing on a number of fronts. The U.S. Government is one of the most active agencies working in this field. Fibre optic standards not specific to shipboard applications, such as those developed by the Electronic Industries Association, can be applied to systems and components used on ships, since they are specific to the technology rather than the application. The practice of applying this technology to shipboard applications has been directly addressed by such organizations as the Society of Naval Architects and Marine Engineers, and the United States Navy.

Canadian activities in fibre optic standards development have been limited to work sponsored by Transport Canada and the Department of National Defence. This work has been promoted through participation in the International Electrotechnical Commission (IEC) and the Society of Naval Architects and Marine Engineers (SNAME).

The main result of the project is that, through membership in a panel of the SNAME, the previously drafted standards have been built into a draft document addressing shipboard fibre optic design guidelines. The IEC committee work is protracted and has not yet reacted to inputs from this project.

It is concluded that Canadian contribution to the various bodies working on shipboard fibre optic standards should be maintained in the interests of safety, economy and business opportunity.

SOMMAIRE

L'élaboration de projets de spécifications concernant les utilisations marines des câbles à fibres optiques ayant fait l'objet d'une recherche antérieure couronnée de succès, la présente recherche a eu pour objectif de promouvoir l'adoption de ces projets, par l'entremise des diverses instances internationales de normalisation concernées.

L'avancement des spécifications sur les utilisations marines des câbles à fibres optiques se constate un peu partout, notamment aux Etats-Unis où les recherches sont les plus actives dans ce domaine. Les spécifications qui ont été élaborées par la Electronic Industries Association et qui ne concernent pas spécifiquement les utilisations marines sont quand même applicables aux systèmes et aux composants embarqués étant donné qu'elles concernent directement la technologie des fibres optiques et non ses utilisations. Quant aux utilisations marines de cette technologie, elles ont été abordées directement par divers organismes tels que la Society of Naval Architects and Marine Engineers (SNAME) ou bien de la marine militaire des Etats-Unis.

Au Canada, seuls Transports Canada et le ministère de la défense nationale se sont intéressés à l'élaboration de spécifications sur les câbles à fibres optiques, travaux dont la promotion a été faite par l'entremise de la Commission Electrotechnique Internationale (CEI) et la SNAME.

Le résultat principal de cette recherche a été l'incorporation, par le truchement d'un comité de la SNAME, des projets de spécifications précités dans un document provisoire traitant des lignes directrices concernant les utilisations marines des câbles à fibres optiques. Quant à l'action de la CEI, elle semble devoir se faire attendre étant donné que cet organisme n'a pas encore donné suite aux propositions faites.

Les chercheurs terminent leur rapport en recommandant que le Canada poursuive sa collaboration avec les divers organismes internationaux de normalisation dans le domaine des utilisations marines des câbles à fibres optiques, dans un triple souci de sécurité, d'économie et de valorisation des affaires.

TABLE OF CONTENTS

1. ACTIVITIES OF STANDARDS WRITING ORGANIZATIONS 1

1.1 Introduction 1
1.2 EIA 1
1.3 IEC 2
1.4 IEEE 2
1.5 ANSI 2
1.6 CSA 3

2. OTHER SOURCES 3

2.1 U.S. Government 3
2.2 SNAME 3

3. CONCLUSIONS 3

APPENDIX A - Publications and Their Sources

A-1 EIA
A-2 IEC
A-3 IEEE
A-4 ANSI
A-5 CSA
A-6 U.S. Government (DoD)
A-7 SNAME

LIST OF ACRONYMS

ANSI	American National Standards Institute
CSA	Canadian Standards Association
DND	Department of National Defence
DOD	Depart of Defense
EEMAC	Electrical and Electronic Manufacturers Association of Canada
EIA	Electronic Industries Association
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronic Engineers
SNAME	Society of Naval Architects and Marine Engineers
TDC	Transportation Development Centre
US	United States (of America)

1.0 ACTIVITIES OF STANDARDS WRITING ORGANIZATIONS

1.1 Introduction

A set of draft standards for the application of fibre optics aboard marine vessels was developed by Focal Marine Limited (now Focal Technologies Incorporated), under contract with the Transportation Development Centre (TDC). These drafts were based on a field test aboard the icebreaker C.C.G.S. Louis S. St. Laurent while on operational duties (TDC Project 6297). The experiment proved that this technology is now sufficiently mature to be considered for marine applications and a set of draft standards was completed accordingly.

The objective of this project has been to promote, and foster the adoption of, shipboard fibre optic standards developed in TDC Project 6297, through work with the Society of Naval Architects and Marine Engineers (SNAME) and the International Electrotechnical Commission (IEC).

The publications of relevant standards-writing organizations were monitored for information on fibre optic standards. These organizations included:

- Electronic Industries Association (EIA)
- International Electrotechnical Commission (IEC)
- Institute of Electrical and Electronic Engineers (IEEE)
- American National Standards Institute (ANSI)
- Canadian Standards Association (CSA)

The methodology used in promoting adoption of the Canadian draft standards was to survey the activities of the above organizations and select those which are active in addressing shipboard standards in a timeframe which is consistent with this project. The following paragraphs summarize the pertinent activities and opportunities.

1.2 Electronic Industries Association

Of these organizations, the most prolific publisher of fibre optic standards has been the EIA. The EIA has thirteen published documents on fibre optic terminology, specifications and standards. Of these publications, the EIA-455 Series is of particular significance. This standard consists of more than eighty-five test procedures with many more in various

stages of preparation. Many of these procedures have been approved for use by the U.S. Department of Defence with little or no change. A listing of EIA publications and their sources is given in Appendix A-1.

1.3 International Electrotechnical Commission

The international nature of the IEC has resulted in a slow rate of publication of fibre optic standards. Canadian involvement in the IEC has primarily been through technical committee 18 (TC 18 - Cables and Cable Installation). Present IEC plans are for the establishment of a subcommittee on fibre optics. Liaison with TC 18 was maintained through two of the committee members: Mr. W.A. (Bill) McCloy and Mr. Frank Szarka. Mr. McCloy presented the chairman of TC 18 with a copy of the draft standards produced by Focal Marine Limited under TDC Project 6297. A listing of IEC publications and their source is given in Appendix A-2.

1.4 Institute of Electrical and Electronic Engineers

The IEEE has established the Optical Communications Committee of the IEEE Communications Society. The work of this committee has resulted in the publishing of ANSI/IEEE Std 812-1984, 'IEEE Standard Definitions of Terms Relating to Fiber Optics'. A listing of IEEE publications and their sources is given in Appendix A-3.

1.5 American National Standards Institute

The American National Standards Institute, Inc. (ANSI) has also endorsed Std 812-1984. The work of Subcommittee X3T9.5 of the Accredited Standards Committee on Information Processing Systems, X3, has led to the publishing of ANSI X3.139-1987, Fiber Distributed Data Interface (FDDI) - Token Ring Media Access Control (MAC). A listing of ANSI publications and their sources is given in Appendix A-4.

1.6 Canadian Standards Association

The only published standard on fibre optics to data by CSA is section 56 of C22.1-1986, '1986 Canadian Electrical Code'. This section, titled 'Optical Fibre Cables' pertains primarily to the installation of fibre optic cables and hybrid cables. A listing of CSA publications and their sources is given in Appendix A-5.

2.0 OTHER SOURCES

2.1 U.S. Government

Agencies within the U.S. Government have been active in developing fibre optic standards and specifications. The Department of Defence (DoD) has published many specifications as well as some standards and handbooks on the subject. The Canadian Department of National Defense (DND) is invited to participate in the development of these documents and has accepted them for use by the DND. These documents and their sources are listed in Appendix A-6.

2.2 SNAME

The Society of Naval Architects and Marine Engineers (SNAME) has established a panel (Panel M-34) under their Ship's Machinery Committee to draft a handbook "Fiber Optic Design Guidelines" to assist the designers, builders, owners and operators of U.S. non-military vessels in the use of fibre optics. During the course of this contract, Focal Technologies Incorporated personnel were the only non U.S. members of this panel. The standards drafted under TDC Project 6297 made a significant contribution to the content of this handbook. SNAME expects to publish the book before the end of 1989. This book can be obtained from SNAME when available. Their address and phone number are given in Appendix A-7.

3.0 CONCLUSION

The project objective of promoting the Canadian draft shipboard fibre optic standards was achieved mainly through the SNAME panel, the result being a draft guideline to assist designers in applying the technology to shipboard use. Other agencies tended to operate in a timeframe that made it difficult to achieve specific progress during the project.

It is recognized that fibre optic standards development is an ongoing process. There is, however, sufficient documentation available to proceed with the use of fibre optics on Canadian vessels.

APPENDIX A PUBLICATIONS AND THEIR SOURCES

A-1 EIA

Fiber Optic Terminology, EIA-440-A

Generic, Sectional, and Blank Detail Specifications for Fiber Optic Communication Cables, EIA-472-Series

Generic Specification for Fiber Optic Connectors, EIA-4750000-A

Generic Specification for Fiber Optic Terminal Devices, EIA-5090000

Generic Specification for Field Portable Optical Fiber Cleaving Equipment, EIA-523000

Generic and Sectional Specifications for Optical Fiber and Splice Closures, EIA-515-Series

Generic and Sectional Specifications for Optical Waveguide Fibers, EIA-492-Series

Optical Fiber Interface That May Be Employed for Synchronous or Asynchronous Point-to-Point Interconnection of Digital Equipment EIA-533

Standard Optical Waveguide Fiber Material Classes and Preferred Sizes, EIA-458-A

Standard Test Procedures for Fiber Optic Fibers, Cables, Transducers, Connecting and Terminating Devices.EIA-455-Series

Generic Specification for Fiber Optic Connectors, EIA-4750000-A

Generic Specification for Field Portable Polishing Device for Preparation of Optical Fibers, EIA-5390000

Generic Specification for a Field Optical Inspection Device, NQ-EIA-5460000 waveguides.

Blank Detail Specification for Class la Multimode, Graded-Index Optical Waveguide Fibers, EIA-492AA00

A-1 Continued

Generic Specification for Optical Waveguide Fibers, EIA-4920000-A

Sectional Specification for Class 1a, Multimode, Graded-Index Optical Waveguide Fibers, EIA-492A000

EIA publications are available in Canada from the Electrical and Electronic Manufactures Association of Canada (EEMAC) at:

Standards Sale Office
EEMAC
10 Carlson Court, Suite 500
Rexdale, Ontario
M9W 6L2

A-2 IEC

IEC 693 Dimensions of Optical Fibres
IEC 793-1 Generic Specification
IEC 793-1 Generic Specification - Amendment 1
IEC 793-2 Product Specification

IEC publications are available in Canada from the Standards Council of Canada at:

Standards Council of Canada
Sales Division
350 Sparks Street, Suite 1200
Ottawa, Ontario
K1P 6N7
1-800-267-8220

A-3 IEEE

ANSI/IEEE Std 812-1984 IEEE Standard Definitions of Terms Relating to Fiber Optics

IEEE publications are available from the Standards Council of Canada as noted in A-2

A-4 ANSI

ANSI X3.139 - 1987 Fiber Distributed Data Interface (FDDI) Token Ring Media Access Control (MAC)

ANSI publications are available from the Standards Council of Canada as noted in A-2.

A-5 CSA

C22.1 - 1986 1986 Canadian Electrical Code - Part 1

CSA publications are available from the Canadian Standards Association at:

Sales Group
Canadian Standards Association
178 Rexdale Blvd.
Rexdale (Toronto), Ontario
M9W 1R3

Number	Title/Description
MIL-HDBK-277 (Navy)	Fiber Optic Checkout Procedure for Military Application
MIL-HDBK-278 (Navy)	Systems Design Guide for Applying FO Technology to Shipboard Systems
MIL-HDBK-282 (Navy)	Fiber Optic Cable Installation Procedure
MIL-HDBK-415	Design Handbook for FO Communication Systems
MIL-STD-188-111	Subsystem Design and Engineering Standards for Common Long Haul and Tactical Fiber Communications
DOD-STD-347	Product Assurance Program Requirements for FO Components
FED-STD-1037A	Glossary of Telecommunication Terms (has FO)
DOD-STD-1678 Notice 1	Fiber Optic Test Methods and Instrumentation
MIL-STD-1773	FO Mechanization of an Aircraft Internal Time Division Command/Response Multiplex Data Bus
MIL-STD-1863A Notice 1	Interface Designs and Dimensions for FO Interconnection Devices
DOD-STD-1864	Fiber Optic Symbols
MIL-STD-2163A	Insert Arrangements for MIL-C-28876
MIL-C-22520/10D	Crimping Tool, Terminal, Hand
DOD-D-24260	Detectors, PIN, Fiber Optic
DOD-D-24620/1	Detectors, PIN, FO, 820-190 nm, Glass-Pigtailed
MIL-D-24620/2	Detector, PIN Diode, TO Can
MIL-D-24620/3	Detector, Avalanche Photo Diode, TO Can
MIL-D-24620/4(CR)	Detector, Type A, Class 2, Pigtailed, DIP
DOD-C-24621	Couplers, Passive, Fiber Optic
DOD-C-24621/1(SH)	Coupler, Fiber Optic Cable, Cable Splitter Passive 2x2, Transmissive Star
DOD-C-24621/2	Coupler, Fiber Optic Cable, Cable Splitter Passsive 4x4, Transmission Star
DOD-C-24621/3	Coupler, Fiber Optic Cable, Cable Splitter Passive 20x20, Transmissive Star
DOD-S-24621/4	Coupler, Fiber Optic Cable, Cable Splitter Passive 5x5, Transmissive Star
DOD-S-24622	Sources, LED, Fiber Optic
DOD-S-24622/1	Sources, LED, FO, Class 1, Glass Pigtailed
MIL-S-24622/2	Source, LED, FO, Type A, Class 1, Style T Metric
DOD-3-24622/3(CR)	Source, LED, Type A, Class 2, Pigtail, DIP
DOD-S-24623	Splice, Fiber Optic Cable
DOD-S-24623/1	Splice, Fiber Optic Cable, Fiber Splice
DOD-S-24623/2	Splice, FO Cable, Fiber Splice Enclosure
DOD-S-24623/3	Splice, Fiber Optic, Cable/Fiber

MIL-H-24626 (Navy)	Harness Assemblies, Cable, Pressure Proof
MIL-H-24626/1 (Navy)	Harness, Cable, Pressure Proof, FO
MIL-P-24627 (Navy)	Penetrators, Bulkhead, Connectorized, FO
MIL-P-24627/1 (Navy)	Penetrators, Bulkhead, Connectorized, FO 32-Channel
MIL-P-24628 (Navy)	Penetrators, Hull, Connectorized, Connectors, Pressure-proof, FO, Submarine
MIL-P-24268/1 (Navy)	Penetrators, Hull, Connectorized, Connectors, Pressure-proof, FO, Submarine Plug Connector
MIL-C-28876C	Connectors, FO, Circular, Plug and Receptacle
MIL-C-28876/1C	Receptacle, Wall Mount w/o Strain Relief
MIL-C-28876/2C	Receptacle, Wall Mount, Strain Relief
MIL-C-28876/3C	Receptacle, Wall Mount, 45°
MIL-C-28876/4C	Receptacle, Wall Mounting, 90°
MIL-C-28876/5C	Receptacle, Wall Mounting, Strain Relief
MIL-C-28876/6C	Plug w/o Strain Relief
MIL-C-28876/7C	Plug, Strain Relief
MIL-C-28876/8C	Plug, Strain Relief, 45°
MIL-C-28876/9C	Plug, Strain Relief, 90°
MIL-C-28876/10C	Dust Cover, Plug
MIL-C-28876/11C	Receptacle, Jam Nut w/o Strain Relief
MIL-C-28876/12C	Receptacle, Jam Nut, Strain Relief
MIL-C-28876/13C	Receptacle, Jam Nut, Strain Relief 45°
MIL-C-28876/14C	Receptacle, Jam Nut, Strain Relief 90°
MIL-C-28876/15C	Dustcover, Receptacle
MIL-C-28876/16	Canceled and superseded by MIL-T-29504/1
MIL-C-28876/17	Canceled and superseded by MIL-T-29504/2
MIL-C-28876/18	Canceled and superseded by MIL-T-29504/3
MIL-C-28876/26B	Receptacle, Wall Mounting, Short Backshell
MIL-C-28876/27B	Backshell, Straight, Strain Relief
MIL-C-28876/28B	Backshell, 45°, Strain Relief
MIL-C-28876/29B	Backshell, 90°, Strain Relief
MIL-T-29504	Termini, Connector, Fiber Optic, General
MIL-T-29054/1	Rear Release, Male, MIL-C-28876 and MIL-C-83526
MIL-T-29054/2	Rear Release, Female, MIL-C-28876 and MIL-C-83526
MIL-T-29054/3	Rear Release, Dummy, MIL-C-28876 and MIL-C-83526
MIL-T-29504/4	Rear Release, Male for MIL-C-38999
MIL-T-29504/5	Rear Release, Female for MIL-C-38999
MIL-T-29504/6	Rear Release, Male for DOD-C-83527
MIL-T-29504/7	Rear Release, Female for DOD-C-83527
MIL-T-29504/8	Front Release, Male for MIL-C-28840
MIL-T-29504/9	Front Release, Female for MIL-C-28840
MIL-T-29504/10	Rear Release, Male for DOD-C-83723 and 83733
MIL-T-29504/11	Rear Release, Female for DOD-C-83723 and 83733
DOD-F-49291	Fiber, Optical, General Specification
DOD-F-49291/1	Fiber, Optical, 50/125, RADIATION HARD
DOD-F-49291/2	Fiber, Optical, 100/140, RADIATION HARD
DOD-F-49291/3	Fiber, Optical, 50/125, NON-RAD HARD
DOD-F-49291/4	Fiber, Optical, 100/140, NON-RAD HARD

MIL-C-49292(CR)	Cable Assembly, Nonpressurized
MIL-C-49292/4(CR)	Cable Assembly, Dual Channel
MIL-C-49292/7(CR)	Cable Assembly, Test (Not Pressure Proof)
MIL-I-81969/46	Tool, Insertion, Size 16, Supersedes MIL-C-28876/19
MIL-I-81969/47	Tool, Removal, Size 16, Supersedes MIL-C-28876/20
MIL-I-81969/48	Tool, Insertion/Removal, Supersedes MIL-C-28876/21
MIL-I-81969/49A	Tool, Insertion/Removal, Size 16, Right Angle
MIL-C-83522B	Connector, Fiber Optic, Single Fiber, General
MIL-C-83522/1D	Connector, Fiber Optic, Single Fiber
MIL-C-83522/2D	Connector, Fiber Optic, Single Fiber
MIL-C-0083522/2E (NA)	Connector, Fiber Optic, Single Fiber
MIL-C-83522/3E	Connector, Fiber Optic, Single Fiber
MIL-C-83522/4E	Connector, Fiber Optic, Single Fiber
MIL-C-83522/5D	Connector, Fiber Optic, Single Fiber
MIL-C-83522/6C	Connector, FO, Expanded Beam, Plug
MIL-C-83522/7B	Connector, FO, Recpt., Parallel P.C. Mount
MIL-C-83522/8B	Connector, FO, Recpt., Hex Mount Bulkhead
MIL-C-83522/12	Connector, FO, Plug, 2.5 mm
MIL-C-83522/13	Connector, FO, Adapter, Bulkhead Mount, 2.5 mm
MIL-C-83522/14	Connector, FO, Adapter, Active Device PC Mount, 2.5 mm
MIL-T-83523	Tools, Fiber Optic
MIL-T-83523/1	Hand Tool, Fiber Optic Termini
MIL-T-83523/2A	Tools, Fiber Optic, Polishing Assembly, Type IV
MIL-T-83523/3A	Tools, Fiber Optic, Scribe Cartridge Type I
MIL-T-83523/4A	Tools, Fiber Optic, Scribe Diamond/Sapphire
MIL-T-83523/5	Retaining Band Strain Relief
MIL-T-83523/6	Polishing, Fixture Assembly Type IV
MIL-T-83523/7	Wrench and Adapter, Torque, Strain Relief
MIL-T-83523/8	Wrench, Spanner, Type V
MIL-T-83523/9	Scribe, Conical and Wedge Type I
MIL-T-83523/10	Tool, Carbide, Diamond, Cleaving
MIL-T-83523/16A	Tools, Fiber Optic Stripper, Type X
MIL-M-83524	Microscope
MIL-K-83525	Kit, Portable Optical Microscope, For Fiber Optic Inspection
MIL-C-83526	Connectors, FO, Hermaphroditic, Circular, Environmental
MIL-C-83526/1	Inline Mounting, 2 and 4 Position
MIL-C-83526/2	Inline Mounting, 6 Position
MIL-C-83526/3	Jam Nut Mounting, 2 and 4 Position
MIL-C-83526/4	Jam Nut Mounting, 6 Position
MIL-C-83526/5	Wallmounting, 6 Position

MIL-C-83526/6	Dust Cover, 2, 4 and 6 Position
MIL-C-83526/7	Dust Cover
MIL-C-83526/8	Dust Cover, 6 Position
MIL-C-83526/9	Hermaphroditic, 2 and 4 Position Test Plug
MIL-C-83526/10	Hermaphroditic, 6 Position Test Plug
MIL-C-83526/11	Jam Nut Mounting, without Strain Relief, 2 and 4 Position
DOD-C-85045C	Cables, Fiber Optics, General Specification for (Metric)
DOD-C-85045/1 A1	Single Fiber, Buffered, Unjacketed
DOD-C-85045/2B	Cables, Fiber Optics, Type I, Class 2
DOD-C-85045/3A	Cables, Fiber Optics, Type I, Class 2
DOD-C-85045/4A	Cables, Fiber Optics, Type I, Class 2
DOD-C-85045/5A	Cables, Fiber Optics, Type I, Class 2
DOD-C-85045/6C	Cables, Fiber Optics, Environment Resisting
DOD-C-85045/8(CR)	Cable, Fiber Optic, Ruggedized, Radition Hardened, Single Jacket
DOD-C-85045/9	FO, Breakout, Individually Jacketed Fibers
DOD-C-85045/10	Fiber Optics, Gel Filling and Flooding Compound
DOD-C-85045/11	Steel Sheath, Gel Filling and Flooding Compound
DOD-C-85045/12(NASA)	Cables, Fiber Optics, High Reliability

A-6 Continued

US Government, Department of Defence publications are available from the Naval Publications and Forms Centres at:

Naval Publications and Forms Centre
Code NPODS
5801 Tabor Avenue
Philadelphia, PA
19120-5099

Use of the attached form facilitates requests for documents.

A-7 SNAME

The handbook "Fiber Optic Design Guidelines" is not yet available from SNAME. Publication is expected by the end of 1989. Once published, the handbook will be available from:

The Society of Naval
Architects and Marine Engineers
601 Pavonia Avenue
Jersey City, NJ
07306

Your CAGE, UIC or System Assigned number goes here

Print or type

Attn:

Your address goes here

If your address has changed please check the box. ☐

Your internal control number goes here

Fill out if necessary

SPECIFICATIONS AND STANDARDS REQUISITION

Please print or type all information. Documents ordered must appear in the DoD Index of Specifications and Standards Requests submitted on this form will speed service Reorder forms will be enclosed with each shipment

FORWARD REQUEST TO:
Naval Publications and Forms Center, Code NPODS
5801 Tabor Avenue, Philadelphia, PA 19120-5099

STANDARDIZATION DOCUMENT NUMBER	QUANTITY	TITLE (From DoD Index of Specifications and Standards)

IMPORTANT NOTES

- *Requests For Official Use Only Documents must be submitted via cognizant DoD Inspection Office or Contract Administrator for certification of "need to know."*
- *Non Government standardization documents will not be furnished to commercial concerns. Copies may be purchased from the appropriate Non Government Association.*
- *Questions concerning documents not listed in the Department of Defense Index of Specifications and Standards (DODISS) should be directed to NPFC Attn: Code 105 or Call (215) 697-2667.*

Please enter your CAGE (formerly FSCM) or UIC number at top of this form. It will expedite your order.

5 SIGNATURE OF REQUESTER	6 DATE PREPARED	7 CLOSING DATE (If RFQ or RFP)

NPFC 4120/6 (3-86)